Deutsches Zentrum für Luft- und Raumfahrt e.V.
in der Helmholtz-Gemeinschaft

Small Satellites Systems and Services – The 4S Symposium
Abstract Submission (Deadline 8.1.2008)

Proposed topic for the paper

Past missions and lessons learned

Title of the paper

Utilisation of the BIRD satellite after its end of Operational Life

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Summary of the paper

The micro satellite mission BIRD successfully demonstrated in 6 years of operations (2001 to 2007) the technical and programmatic feasibility to combine ambitious science and innovative but not necessarily space-proven components under “design to costs” constraints. The BIRD was designed for the remote detection and sensing of hot spot events like vegetation fires, coal seam fires or active volcanoes from space. Data products in form of thermal maps and information of the related energy release can be developed for the users.

BIRD has a mass of 92kg and was launched with the Indian PSLV-C3 from Sriharikota on October 22, 2001 into a Sun-synchronous circular orbit with an altitude of about 568km. One of the main goals of BIRD was to demonstrate both the advantages as well as limits of a variety of new technology experiments. The paper describes these new technologies as well as their in-flight performance. In 2008, after 6 years of flight during which BIRD delivered highly valuable infrared sensor data allowing the detection of hot spots in a sub-pixel range with a spatial resolution down to 2 square meters, the spacecraft-routine-operation-phase will be officially terminated. Despite the damage of three reaction wheels and the gyroscope, BIRD still fully functional with the whole payload and in all other sub-systems. The pointing accuracy depends now on the still working attitude sensors (magnetometer, sun-sensor) and actuators (magnetorquer) with a smaller precision than before.
DLR is currently investigating future missions, which are based on the BIRD experience and design (e.g., the TET mission scheduled to be launched in October 2009 and the “Kompakt-Satellite Serie”, SSB scheduled for launch 2011). Taking advantage of the common design philosophy of BIRD, TET, and SSB we suggest a continued on-demand use of BIRD as a unique orbital test bed for the development of SSB and TET. New algorithms and operational strategies can first be tested on BIRD by software upload before taking risks on its successors. Magnetorquer attitude control can

be tested and improved. The long time behaviour of the battery stacks will be evaluated. Atmospheric drag models can be verified to allow a more precise lifetime prediction. Non-propulsive orbit control techniques for safe de-orbiting using impaired attitude control systems can be evaluated, characterized and tested. The actual radiation tolerance limits of all of BIRD’s components can be explored through a full solar activity cycle using standard telemetry data. For the IR sensor system, especially for the Stirling-Coolers, long life tests will be give new inputs for the development of IR-payload for the TET- Satellite.